Yagi Antenna Research

# SRT-3 Daedalus

Yagi Antennas are useful at tracking radio frequencies and would be useful for tracking the rocket.

The following webpage is a good exploration of the whole GPS tracking process <http://www.jcrocket.com/gps-tracking.shtml> (you can find the transmitter comparison chart here)

Yagi Antennas specifically are explained in detail here.

<http://www.radio-electronics.com/info/antennas/yagi/yagi-antenna-theory.php>

Concerning Yagi antenna construction I found this good calculator that specifies all of the dimensions required to build a Yagi antenna for our wave length. <http://www.vk5dj.com/yagi.html>

An example of some of the dimensions outputted for a 433 MHZ Yagi antenna.

Yagi design frequency =433.00 MHz

Wavelength =692 mm

Parasitic elements fastened to a non-metallic or separated from boom

Folded dipole mounted same as directors and reflector

Director/reflector diam =6 mm

Radiator diam =6 mm

REFLECTOR

336.2 mm long at boom position = 30 mm (IT = 155.5 mm)

RADIATOR

Single dipole 323.3 mm tip to tip, spaced 138 mm from reflector at boom posn 168 mm (IT = 149.0 mm)

Folded dipole 329.8 mm tip to tip, spaced 138 mm from reflector at boom posn 168 mm (IT = 152.5 mm)

DIRECTORS

Dir Length Spaced Boom position IT Gain Gain

(no.) (mm) (mm) (mm) (mm) (dBd) (dBi)

1 296.2 51.9 220.4 135.5 4.8 6.9

2 292.6 124.6 345.0 134.0 6.5 8.6

3 289.3 148.9 493.9 132.0 7.8 9.9

4 286.2 173.1 667.0 130.5 8.9 11.0

5 283.3 193.9 860.8 129.0 9.8 11.9

6 280.6 207.7 1068.5 128.0 10.5 12.7

7 278.2 218.1 1286.6 126.5 11.2 13.3

8 275.9 228.5 1515.1 125.5 11.7 13.9

9 273.8 238.9 1754.0 124.5 12.2 14.4

10 271.8 249.2 2003.2 123.5 12.7 14.9

COMMENTS

The abbreviation "IT" means "Insert To", it is the construction distance from the element tip to the edge of the boom for through boom mounting

Spacings measured centre to centre from previous element

Tolerance for element lengths is +/- 2 mm

Boom position is the mounting point for each element as measured from the rear of the boom and includes the 30 mm overhang.The total boom length is 2033 mm including two overhangs of 30 mm

The beam's estimated 3dB beamwidth is 37 deg

FOLDED DIPOLE CONSTRUCTION

Measurements are taken from the inside of bends

Folded dipole length measured tip to tip = 330mm

Total rod length =690mm

Centre of rod=345mm

Distance BC=CD=147mm

Distance HI=GF=142mm

Distance HA=GE=170mm

Distance HB=GD=197mm

Distance HC=GC=345mm

Gap at HG=10mm

Bend diameter BI=DF=35mm

If the folded dipole is considered as a flat plane (see ARRL Antenna Handbook) then its resonant frequency is less than the flat plane algorithm's range of 10:1

MATERIALS GUIDE for purchase. Allow extra, do NOT use these figures for cutting

NO allowance for saw cuts or purchased lengths resulting in waste

1) Length used by directors and reflector 3164mm of round 6mm rod

2) Length used by single dipole 323mm or folded dipole 690mm of round 6mm rod

3) Length used for boom 2033mm (allows for 30mm each end) square section 25mm

Also I found a good video of a guy showing off a very inexpensive and semi inexpensive version of a 7 and 10 element Yagi antenna for the 70 cm band. <https://youtu.be/1Wl6Cy4ovig>

PS. Yagi antennas are most efficient when pointed directly at the transmitter so if we do build a mount or a tall stand for the antenna a vertical orientation of the antenna would be favorable.